AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A method for providing a transposed signal which is transposed by a factor M, comprising the following steps:

filtering an input signal through a parallel bank of L filters with impulse responses as

$$h_k(n) = K\, p_0(n) \exp\left[j\frac{\pi}{2L}(2k+1)(n-\frac{N-1}{2}) + j(-1)^k \frac{\pi}{4M} \right],$$

where k = 0, 1, ..., L-1, K is a constant, and $p_0(n)$ is a lowpass prototype filter of length ~~A~~ N, producing a set of L complex-valued signals;

downsampling said set of L signals with a factor L/M, producing a set of L complex-valued subband signals;

multiplying phase-angles of said set of L complex-valued subband signals by M, giving a new set of subband signals;

selecting real parts of said new set of subband signals, resulting in a set of L real-valued subband signals;

upsampling a subset of said set of L real-valued subband signals with a factor L', producing a set of real-valued signals;

filtering said set of real-valued signals through a parallel bank of L' filters with impulse responses as

$$\cancel{f_k(n) = K'\, p_0'(n) \cos\left[\frac{\pi}{2L'}(2kk'+1)(n-\frac{N'-1}{2}) - (-1)^k \frac{\pi}{4} \right]}$$

$$\underline{f_k(n) = K' p_0'(n) \cos\left[\frac{\pi}{2L'}(2k'+1)(n - \frac{N'-1}{2}) - (-1)^{k'}\frac{\pi}{4}\right]},$$

where ~~k~~ k' = 0, 1,..., L'-1, K' is a constant and ~~p'0(n)~~ $\underline{p_0'(n)}$ is a lowpass prototype filter of length N', forming a set of L' filtered signals; and

adding said set of L' filtered signals and the input signal to produce a transposed signal.

2. (Currently Amended) A method according to claim 1, wherein the step of multiplying ~~of~~ said phase-angles and the step of selecting ~~of the real part~~ said real parts, is computed by the following steps:

~~writing~~ providing said set of complex-valued subband signals as

$$Z_k(n) = R_k(n) + j\,I_k(n),$$

where $R_k(n)$ and $I_k(n)$ are real and imaginary parts of $Z_k(n)$, respectively;

calculating said set of real-valued subband signals $W_k(n)$ as

$$W_k(n) = |Z_k(n)| \cos\left\{M \arctan\left(\frac{I_k(n)}{R_k(n)}\right)\right\},$$

where $|Z_k(n)| = \mathrm{sqrt}\{R_k(n)^2 + I_k(n)^2\}$ and M is a positive integer transposition factor, using a following trigonometric identity

$$\cos(Ma) = \cos^M(a) - \binom{M}{2}\sin^2(a)\cos^{M-2}(a) + \binom{M}{4}\sin^4(a)\cos^{M-4}(a)\ldots,$$

where $a = \arctan\{I_k(n)/R_k(n)\}$, and following relations

$$\cos(a) = \frac{R_k(n)}{|Z_k(n)|} \text{ and } \sin(a) = \frac{I_k(n)}{|Z_k(n)|};$$

whereby ~~reducing~~ computational complexity <u>is reduced</u> by elimination of all trigonometric calculations.

3. (Currently Amended) A method according to claim 1, further including the following steps:

on a block basis, extracting information conveyed by the phase-difference of an adjacent pair of said complex-valued subband signals;

performing said ~~multiplication~~ <u>multiplying</u> of said phase-angles by M, forming a pair of said new subband signals; and

negating one of said new subband signals, on a condition provided by said information; whereby 180° phaseshifts of the subband signals are retained when employing an even integer-valued transposition factor M.

4. (Original) A method according to claim 3, in which said information is given by the dot-product of said complex-valued subband signals $Z_k(n)$ and $Z_{k+1}(n)$ according to

$$Z_k(n) \circ Z_{k+1}(n) = R_k(n)R_{k+1}(n) + I_k(n)I_{k+1}(n),$$

where $R_i(n)$ and $I_i(n)$ are real and imaginary parts of $Z_i(n)$ respectively, i = k, k+1, and one of said new subband signals is negated provided said dot-product is negative.

5. (Currently Amended) An apparatus for providing a transposed signal which is transposed by a factor M, comprising:

a filter for filtering an input signal through a parallel bank of L filters with impulse responses as

$$h_k(n) = K\, p_0(n) \exp\left[j\frac{\pi}{2L}(2k+1)(n - \frac{N-1}{2}) + j(-1)^k \frac{\pi}{4M} \right],$$

where k = 0, 1,..., L-1, K is a constant, ~~po(n)~~ $\underline{p_o(n)}$ is a lowpass prototype filter of length N, and M is the factor, producing a set of L complex-valued signals;

a downsampler for downsampling said set of L signals with a factor L/M, producing a set of L complex-valued subband signals;

a multiplier for multiplying phase-angles of said set of complex-valued subband signals by M, giving a new set of subband signals;

a selector for selecting real parts of said new set of subband signals, resulting in a set of L real-valued subband signals;

an upsampler for upsampling a subset of said set of L real-valued subband signals with a factor L', producing a set of real-valued signals;

a filter for filtering said set of real-valued signals through a parallel bank of L'filters with impulse responses as

$$\cancel{f_k(n) = K'\, p_0'(n) \cos\left[\frac{\pi}{2L'}(2kk'+1)(n-\frac{N'-1}{2}) - (-1)^k \frac{\pi}{4}\right]}$$

$$\underline{f_k(n) = K'\, p_0'(n) \cos\left[\frac{\pi}{2L'}(2k'+1)(n-\frac{N'-1}{2}) - (-1)^{k'} \frac{\pi}{4}\right]},$$

where ~~k~~ k' = 0, 1,..., L'-1, ~~K~~ K', is a constant and ~~p'0(n)~~ $p_0'(n)$ is a lowpass prototype filter of length ~~N~~ N', forming a set of L' filtered signals; and

an adder for adding said set of L' filtered signals and the input signal to produce the transposed signal.